BCM-SQ700-AS

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CONFIDENTIAL INFORMATION

BnCOM Co.,Ltd.

BCM-SQ700-AS Bluetooth Module User manual

Version 0.0.1

Revision History

DATE	VERSION	DESCRIPTION	AUTHOR
2023-08-04	0.0.1	Draft version	Hjbyun

Table of Contents

1. Introduction

PURPOSE

This document presents the AT command set supported by BnCOM Bluetooth audio module and describes the protocol used to control and configure.

INTENDED AUDIENCE AND PERTINENT SECTIONS

This document is intended for BnCOM customers, especially system integrators, about to implement Bluetooth modules in their application.

Readers of this document should be familiar with BnCOM modules and their ease of controlling by means of AT commands.

2. References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

[1] ITU-T Recommendation V.250: "Serial asynchronous automatic dialing and control".
[2] Bluetooth Core specification v5.2
[3] Supplement to the Bluetooth Code Specification
[4] Bluetooth Profile Specification: "Hands-Free Profile 1.8".
[5] Bluetooth Profile Specification: "Advanced Audio Distribution v1.3.2".
[6] Bluetooth Profile Specification: "Audio/Video Remote Control v1.6.2".

3. Definitions and abbreviations

3.1 Definitions

For the purpose of the present document, the following syntactical definitions apply:

- <CR> Carriage return character, is the command line and result code terminator character.
- <LF> Linefeed character.
- <…> Name enclosed in angle brackets is a parameter. The angle brackets themselves do not appear in the command line.
- […] Square brackets are used to indicate that the enclosed items are optional. The square brackets themselves do not appear in the command line.
- **Underline** Underlined defined sub parameter value is the recommended default setting of this sub parameter.

3.2 Abbreviations

For the purpose of the present document, the following abbreviation apply:

- DCE Data Communication Controller
- DTE Data Terminal Equipment
- SRC A device is the **SRC** when it acts as a source of a digital audio stream that is delivered to the SNK of the piconet
- SNK A device is the **SNK** when it acts as a sink of a digital audio stream delivered from the SRC on the same piconet

4. AT Command syntax and procedures

In this document, the following naming conventions are used:

- DCE (Data Communication Equipment): Bluetooth Audio module.
- DTE (Data Termination Equipment): The terminal that command to the module, e.g., PC or MCU.

4.1 Command Line

Command line general format

A command line is made up of three elements: the prefix, the body, and the termination character.

- The command line prefix consists of the characters "**AT**".
- The body is made up of individual commands as specified later in this document.
- The termination character should be a carriage return character **<CR>** and it may not appear in the body.

The command line buffer can accept a maximum of **80** characters. If the characters entered exceeded this number, then **ERROR** will be returned.

Case Sensitivity of Commands

In this document, all AT commands are in uppercase letters.

4.2 Basic Syntax commands

The format of basic syntax commands is as follows:

<command>[<number>]

- **<command>** is either a single character, or the "**&**" character followed by a single character. Characters used in <command> shall be taken from the set of alphabetic characters.
- **<number>** may be a string of one character from "**0**" through "**9**" representing a decimal integer value.
- If a command expects **<number>** and it is missing, the default value is assumed.
- If a command does not expect a **<number>** and a number is present, an **ERROR** is generated.

4.3 Extended Syntax commands

The name of extended syntax commands always begins with character "**+**" and the first character following the "**+**" shall be an alphabetic character in the range of "**A**" through "**Z**".

Type of extended syntax commands

There are four types of extended syntax command operations:

- Test command - Checks whether a certain AT command is supported.
  +<name>=?
- Set command - Changes the settings.
  +<name>=<value>
  +<name>=<compound value>
- Read command - Retrieves the current settings.

+<name>?

- Execution command - Perform an action or retrieve information/status.
  +<name>

4.4 Information responses and result codes

Response format

Information responses and result codes always start and end with a carriage return character **<CR>** and a linefeed character **<LF>**.

There are three types of result codes: final, intermediate, and unsolicited.

- A final result codes indicate that the execution of currently running AT commands is finished.
  As an example, it can be any one of following types:
  If command is successful.
  OK
  If the command has wrong format/command is invalid/command is not applicable, etc.
  ERROR
- An intermediate result code (IRC) is a report of the progress of a DCE action.
  +<name>
  +<name>: <value>
  +<name>: <compound_value>
  Note that a single space character separates the colon character from the <value>.
- Unsolicited result codes (URC) indicate the occurrence of an event not directly associated the issuance of a command from DTE.

Range of values

For example, the following are some examples of value range indications:

(0)	Only the value 0 is supported
(1,2,3)	The values 1, 2, and 3 are supported
(1-3)	The values 1 through 3 are supported

4.5 Informative examples

Extended syntax result codes			
Command	**Syntax**	**Example**	**Possible Response(s)[*1]**
Test	+<name>=?	AT+UART=?**<CR>**	**<CR><LF>** +UART: (9600-1382400),(1,2),(N,O,E)**<CR><LF>** **<CR><LF>**OK**<CR><LF>**
Set	+<name>=[<value>]	AT+UART=115200,1,N**<CR>**	**<CR><LF>**OK**<CR><LF>**
Read	+<name>?	AT+UART?**<CR>**	**<CR><LF>** +UART: 115200,1,N**<CR><LF>** **<CR><LF>**OK**<CR><LF>**
Execution	+<name>	AT+UART**<CR>**	**<CR><LF>**ERROR**<CR><LF>**

5. General Commands

5.1 ATtention

Description

Attention command determining the presence of a DCE, i.e., the Bluetooth audio module.

Syntax

Command	Possible Response(s)
AT	OK | No response

Defined values

None

Result codes

OK If the DTE and DCE are connected properly
No response

5.2 Soft reset Z

Description

This command forces a reboot (warm reset) of the module

Syntax

Command	Possible Response(s)
ATZ	OK | ERROR

Defined values

None

Result codes

OK If the DTE and DCE are connected properly
No response

Examples

```
ATZ
OK
                                    # Rebooted within a second.
PAIRING
```

5.3 Set to factory-defined configuration &F

Description

This command resets all settings to their factory default values specified by the manufacturer

Syntax

Command	Possible Response(s)
AT&F[<value>]	OK | ERROR

Defined values[*1]

0 Restore factory settings and reboot within a second[*1]
1 Remove all paired device lists
(other) Reserved for manufacturer proprietary use

Examples

```
AT&F0
OK
                                    # Rebooted within a second
PAIRING
```

5.4 Version information +VERSION

Description

Display firmware version

Command	Possible Response(s)
AT+VERSION?	+VERSION: <major>.<minor>.<patch> OK

Defined values

None

Examples

```
AT+VERSION?
+VERSION: 00.00.01
OK
```

5.5 Bluetooth local name +LOCALNAME

Description

Change Bluetooth local name

Syntax

Command	Possible Response(s)
AT+LOCALNAME=<name>	OK | ERROR
AT+LOCALNAME?	+LOCALNAME: <name> OK

Defined values

<name> 1 to 31 characters in length

Examples

```
AT+LOCALNAME=BCM-SQ700-AS      # Set local name
OK
AT+LOCALNAME?                  # Read current local name
+LOCALNAME: BCM-SQ700-AS
OK
```

5.6 Bluetooth local address +LOCALADDR

Description

This command can be used to read the local Bluetooth address.

Syntax

Command	Possible Response(s)
AT+LOCALADDR?	+LOCALADDR: <address> OK

Defined values
None

Examples

```
AT+LOCALADDR?                    # Read address
+LOCALADDR: 74F07D000000
OK
```

5.7 Power On/Off +POWER

Description
This command is used to power on or off the module

Syntax

Command	Possible Response(s)
AT+POWER=<value>	OK | ERROR
AT+POWER=?	+POWER: (list of supported <value>) OK

Defined values

0	Power off
1	Power on
(other)	Reserved for manufacturer proprietary use.

Examples

```
READY                            # Ready
AT+POWER=1
OK
PAIRING                          # Pairing
```

5.8 Connection establishment +CONNECT

Description
This command attempts to establish a connection to last connected device

Syntax

Command	Possible Response(s)
AT+CONNECT[=<MAC>]	OK | ERROR

Defined values*1
<MAC>
Device MAC address

Notes
*1: If <MAC> is missing, the value last paired device mac address is assumed.

Examples

```
CONNECTABLE                      # Connectable
AT+CONNECT=112233445566          # Connect
OK
CONNECT 112233445566             # Connecting to 112233445566
+CONNECTED: 112233445566         # Connected
```

5.9 Release connection +DISCONNECT

Description

This command used to disconnect active connection

Syntax

Command	Possible Response(s)
AT+DISCONNECT	OK | ERROR

Defined values

None

Examples

CONNECTED: 112233445566	# Connected
AT+DISCONNECT	# Initiate to disconnect
OK	
+DISCONNECTED: 112233445566	# Disconnected
PAIRING	# Pairing

6. HFP Commands

6.1 Answer an incoming call +ANSWER

Description
- Answer an incoming call

Syntax

Command	Possible Response(s)
AT+ANSWER	OK | ERROR

Defined values
- None

Examples

```
INCOMING CALL                # Incoming call
RING                         # Ringing
CID: 01012345678             # CID is optional
…
AT+ANSWER                    # Answer the incoming call
OK
ONGOING CALL                 # Call active
```

6.2 Reject/Terminate a call +CHUP

Description
- This command rejects an incoming call or terminate an ongoing call process

Syntax

Command	Possible Response(s)
AT+CHUP	OK | ERROR

Defined values
- None

Examples

```
ONGOING CALL                 # Call active

AT+CHUP                      # Terminate a call
OK
CALL ENDED                   # Call terminated
```

6.3 Place a call with the phone number +DIAL

Description
- This command initiates outgoing voice calls by providing the destination phone number to the AG.

Syntax

Command	Possible Response(s)
AT+DIAL=<value>	OK | ERROR | NO CARRIER

Defined values
"0…9, *, #, +, -" Dialing digits

Result codes

OK	If value is valid
ERROR	If value is not recognized or not supported

Examples

```
CONNECTED: 01,112233445566          # Connected
AT+DIAL=+82-10-1234-5678            # Dialing to "082 010 1234 5678"
OK
```

6.4 Last number re-dial +BLDN

Description

- This command initiates outgoing voice calls by recalling the last number dialed by the AG.

Syntax

Command	Possible Response(s)
AT+BLDN	OK | ERROR | NO CARRIER

Defined values

- None

Result codes

OK	If value is valid
ERROR	If value is not recognized or not supported
NO CARRIER	If network service is not available

Examples

```
CONNECTED: 01,112233445566          # Connected
AT+BLDN                             # Place call to the last number dialed
OK
OUTGOING CALL                       # Outgoing call initiated
```

6.5 Volume gain SCO +VGM

Description

Adjust speaker volume level of SNK device via SCO

Syntax

Command*1	Possible Response(s)
AT+VGM=<value>	OK | ERROR
AT+VGM?	+VGM: <gain> OK
AT+VGM=?	+VGM: (range of supported <value>) OK

Defined values

0 to 15	Decimal integers indicating the speaker gain
+	Volume up
-	Volume down

Notes

*1: can only adjust the volume during a call.

Examples

AT+VGM=8	# Set the volume to 8 level
OK	
AT+VGM=+	# Increase volume level
OK	
AT+VGM?	# Read current volume level
+VGM: 9	
OK	

7. Configuration Commands

7.1 I2S internal settings +SETI2S

Description

- Change the settings of I2S used internally

Syntax

Command	Possible Response(s)
AT+SETI2S=<cmd>,<value>	OK | ERROR

Defined values

■ Defines the possible audio output hardware types		
<cmd>	1	
<value>*1	**0**	Internal hardware DAC
	1	I2S
■ Master or slave operation		
<cmd>	2	
<value>	0	Slave
	1	Master
■ Specifies whether to resample music rates for i2s output (in HZ)		
<cmd>	3	
<value>	0	No resampling
	44100	44.1kHz
	48000	48.0kHz
■ Specifies the number of bits in each audio sample		
<cmd>	4	
<value>	0	16 bits
	1	24 bits
	2	32 bits
■ Select between left justified and right justified		
<cmd>	5	
<value>	**0**	Left justified
	1	Right justified
■ Justified delays by 1 bit		
<cmd>	6	
<value>	0	No delay
	1	1-bit delay
■ Specifies the I2S bit clock rate (BCLK) as a multiple of the sample rate, output when running is in I2S master mode		
<cmd>	7	
<value>	0…**64**	
■ Specifies the I2S master clock rate (MCLK) as a multiple of the sample rate		
<cmd>	8	
<value>	**0**	Disable
■ Specifies whether to resample voice rates for i2s output (in HZ)		
<cmd>	9	
<value>	**0**	No resampling
	44100	44.1kHz
	48000	48.0kHz

Notes
*1: Changes to this value should be rebooted to take effect.

Examples

```
AT+SETI2S=4,48000          # Set resampling music rates for i2s output to 48000
OK
```

7.2 UART configuration +UART

Description

Change baud rate, parity and stop bits of UART in run-time

Syntax

Command	Possible Response(s)
AT+UART=<baud>,<stop>,<parity>	OK | ERROR
AT+UART?	+UART: <baud>,<stop>,<parity> OK
AT+UART=?	+UART: (list of supported <baud>),(list of supported <stop>),(list of supported <parity>) OK

Defined values

<baud> The UART baud rate
9600
19200
38400
115200
230400
460800
921600
1382400

<stop> The number of stop bits
1 One bit
2 Two bits

<parity> The parity to use
N None
O Odd
E Even

Examples

```
AT+UART=115200,1,N         # Change UART to 115200 baud, 1 stop bit, no parity
OK
AT+UART?                   # Read current settings
+UART: 115200,1,N
OK
```

8. Information text and result codes

An information text is a string message provided by the DCE. It can be output at any time to inform the DTE of a specific event or status change.

URC	Description
POWER OFF	The DCE is powered off
CONNECATBLE	The DCE is connectable
PAIRING	The DCE is discoverable
PAIR FAILED	Pairing is failed or timed-out
CONNECT FAIL	Connection failed
+CONNECTED: <MAC>	Connected ▪ Parameters <MAC> Address of connected device ▪ Example CONNECTED: AABBCCDDEEFF
+DISCONNECTED: <MAC>	Disconnected ▪ Parameters <MAC> Address of disconnected device ▪ Example DISCONNECTED: AABBCCDDEEFF

APPENDICES

APPENDIX A: LED Pattern

Status	LED Num	Working
Pairing	0	blink interval 0.2s ■ 0.1s ON, 0.1s OFF, … Repeated
Connected	0	blink interval 1s ■ 0.1s ON, 0.9s OFF, … Repeated
IDLE	0	blink interval 2s ■ 0.1s ON, 1.9s OFF, … Repeated
Streaming	1	blink-blink interval 2s ■ 0.05s ON, 0.05s OFF, 0.05s ON, 1.85s OFF, … Repeated
Call incoming	0, 1	blink-blink interval 1s ■ 0.05s ON, 0.05s OFF, 0.05s ON, 0.85s OFF, … Repeated
Calling	1	blink-blink interval 2s ■ 0.05s ON, 0.05s OFF, 0.05s ON, 1.85s OFF, … Repeated

APPENDIX B: ISSUES

List all unresolved issues, TBDs, pending decisions, findings required, conflicts, etc.

ISSUES		
ID	DESCRIPTION	PARTY RESPONSIBLE

FCC MODULAR APPROVAL INFORMATION EXAMPLES for Manual

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference.

(2) This device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

OEM INTEGRATION INSTRUCTIONS:

This device is intended only for OEM integrators under the following conditions:

The module must be installed in the host equipment such that 20 cm is maintained between the antenna and users, and the transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the internal on-board antenna that has been originally tested and certified with this module. External antennas are not supported. As long as these 3 conditions above are met, further transmitter test will not be required.

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.). The end-product may need Verification testing, Declaration of Conformity testing, a Permissive Class II Change or new Certification. Please involve a FCC certification specialist in order to determine what will be exactly applicable for the end-product.

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization. In such cases, please involve a FCC certification specialist in order to determine if a Permissive Class II Change or new Certification is required.

Upgrade Firmware:

The software provided for firmware upgrade will not be capable to affect any RF parameters as certified for the FCC for this module, in order to prevent compliance issues.

End product labeling:

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: 2APDI-BCM-LA100-AS".

Information that must be placed in the end user manual:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

RSS-GEN Section

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:(1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RSS-102 RF Exposure

L'antenne (ou les antennes) doit être installée de façon à maintenir à tout instant une distance minimum de au moins 20 cm entre la source de radiation (l'antenne) et toute personne physique. Cet appareil ne doit pas être installé ou utilisé en conjonction avec une autre antenne ou émetteur.